

CEILING MOUNTED DEVICE FOR IMPROVED AIR CIRCULATION AND QUALITY

FIELD OF INVENTION

- 5 The present invention relates to a ceiling mounted bladeless fan with ionisers and UV light to improve air quality and air circulation in an enclosed environment.

BACKGROUND OF THE INVENTION

- 10 The main function of a fan is to circulate the surrounding air. A ceiling fan is often used to circulate air in an enclosed environment such as a room. With the recent pandemic in mind, many people have included the use of an UV light source in an enclosed space with the objective of killing the air borne viruses and bacteria circulating in the surroundings. However, there is a forecast of haze during the dry season. The haze
15 brings into enclosed spaces particulates and a smoky odour. People have started using an ionizer to remove air particulates and the smell of smoke in the surroundings by using an ionizer.

- Consumers often ended up using fans, ionizers and UV lamps separately for the
20 purpose of improving air quality in their homes.

- Ionizers use negative ions to remove small particles in the air. This can help reduce odors and make the air seem fresher. Negative ions have also been found to inhibit viruses, bacteria, and mold species. A drawback of ionizers is that while negative ions
25 are generated, the negative ions are not evenly distributed and circulated since its circulation depends on other factors in the enclosed environment.

- UV C (Ultra Violet C) has anti-germicidal properties and are used to sterilize workspaces and tools. UV-C LEDs are used to target a specific wavelength needed for
30 disinfection. This is especially important knowing that pathogens vary in their sensitivity to specific UV wavelengths. LEDs are mercury free, instant on/off, and have unlimited cycling throughout the day. UV C are not circulated and it may be blocked by articles

and structures in an enclosed environment and hence not able to access all areas and spaces in an enclosed environment.

The fan has been around for a long time. The fan has undergone improvements and bladeless fans are common devices used for air circulation in homes. However, these fans only perform the function of improving air circulation but does not improve the quality of air, which is left to ionizers and UV lamps.

DISCUSSION OF PRIOR ART

WO 2013/117895 (Dyson Technology Limited) discloses a bladeless fan with an ionizer. A fan includes a base and a nozzle mounted on the base. The base includes an impeller and a motor for driving the impeller to generate an air flow. The nozzle includes an air inlet, an air outlet, and an annular casing which defines a bore through which air from outside the fan is drawn by air emitted from the air outlet. An ionizer is located within the bore of the nozzle for treating the air drawn through the bore.

US 2007/0036696 A1 discloses an air purifier with an UV C radiation. The invention consists of a housing having walls defining a lower chamber and an upper chamber, and ultraviolet C lamp in the lower chamber. Air flows through an air inlet through a wall into the lower chamber. A baffle is positioned between the air inlet and the lamp blocking direct passage of radiation from the lamp to the air inlet. A dividing wall in the housing separates the upper chamber from the lower chamber, and an opening in the dividing wall allows air to pass from the lower chamber to the upper chamber. Air exits through an air outlet from the upper chamber, with the dividing wall being positioned to block direct passage of radiation from the lamp to the outlet. A fan in the upper chamber draws air in the inlet, through the lower chamber, and the opening in the wall, and directs the air to the outlet. The intensity of the lamp and the closeness of the passage of air around the lamp, together with the flow rate of the air assure that air born germs are exposed to a controlled flux of UV C radiation, which is generally selected to be fatal to the vast majority of such germs.

US Publication No. 2011/0030560 discloses a convertible air cleaner adapted for use in a tower or non tower orientation. In the air cleaner, the air inlet is disposed substantially opposite the air outlet, and the air cleaner is adapted to create an airflow between the air inlet and the air outlet when the air cleaner is in a tower or a non-tower orientation.

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SG11201510020Y discloses a ventilator for ventilating/cooling a space making use of an "Induced Vortex" to induce amplified air-flow for space cooling. The invention lifts cold air from the floor level to be funnelled up, amplified and distributed over the user(s) or occupant(s) through an entirely new three-dimensional (3-D) vortex air flow pattern.

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PROBLEM TO BE SOLVED

A fan would only move the surrounding air and by so doing, create a air current to move the remaining air in an enclosed environment thereby creating circulation of the air in the enclosed space. Most of the fans with blades are installed on a ceiling or top of enclosed space in a house. A bladeless fan would save space but most bladeless fans are currently placed on the floor and not be installed on a ceiling.

An ioniser would only remove small particles including viruses and bacteria in the air and help to reduce odors and make the air seem fresher. Again ionisers are always placed on ground level or on top of a table.

An UV-C Light would only kill bacteria and viruses by sterilization of the surrounding so long as the rays of the UV-C light reaches the area. Due to the hazard of direct illumination of UV-C light, such UV-C lights are placed above eye level so as to ensure users do not look at the UV-C light directly.

Devices incorporating blowers and ionisers have been proposed. However there is no one device which incorporates the function of improving air circulation, killing air borne viruses and bacteria by sterilizing the surroundings and remove air particulates and odors in the air.

The inventor has proposed creating a fan with an ionizer and UV light source which odor but create air movement within an enclosed environment thus ensuring circulation of air. Furthermore, the innovative device must be compact and works synergistically to improve air quality and air circulation in an enclosed environment.

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Due to the use of UV lamps, the ideal position of the innovative device for installation would be a location in an enclosed area away from human beings. Since UV lights are usually installed near the top of an enclosed area, incorporating the UV lights into the innovative device and installing it on the ceiling of a room would be the good solution.

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Finally, it would be ideal if each of the functions – fan or ionizer or UV lamp – could be operated independently as the situation demands – so that any feature for improving quality of air circulation or removing of bad odors or air borne particulates or sterilising the air by killing air borne viruses and bacteria may efficiently switched on.

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SUMMARY OF INVENTION

A first object of the Invention is a device for improved air circulation and quality in an enclosed space, having a rectangular housing structure, four corners and sides, a base
20 for fixing the rectangular housing structure to a ceiling, with air inlets for air in the surroundings to be drawn into the housing structure and air outlets for air to be drawn from the rectangular housing structure, and circulated back into the enclosed space, the device comprising :-

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a. a plurality of ionizers to remove odors and air particulates;

b. a plurality of UV lamps;

c. a plurality of Bladeless Fans; and

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d. a Central Controls System which controls the operations of each ionizer, each UV lamp and each Bladeless Fan,

all of which are compactly laid out in the rectangular housing structure to treat and improve the quality of air in the surroundings.

Preferably the device for improved air circulation and air quality in an enclosed space, draws air in the enclosed space going through the air inlets of the rectangular housing structure being drawn in by the Bladeless Fans, going through the plurality of ionizers, thereby removing odors and air particulates, further treated by the UV Lamps to kill airborne bacteria and viruses, and the air being treated being expelled through the air outlets in the rectangular housing structure, thereby improving air circulation in the enclosed space with improved quality air with odors and air particulates having been removed and air borne bacteria and viruses having been killed.

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Preferably the ionizers are installed in three corners of the rectangular housing structure and a control board installed in the fourth corner of the rectangular housing structure.

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Preferably the UV lamps are installed on the base of the rectangular housing structure.

Preferably, the UV lamps has a protective cover over the UV lamps and installed below the lamps, with an air gap between the UV lamps and the protective cover.

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Preferably, the UV lamps operates with a wavelength of 254 nanometers.

Preferably the ionisers are installed in the 1st to 3rd corners of the housing structure and operated and controlled by a control board installed at the 4th corner of the housing structure.

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More advantageously, the Bladeless Fans are installed on each side of the rectangular housing structure having a rotatable Fan Wheel and a motor to turn the rotatable Fan

Wheel, drawing air from the surrounding into the rectangular housing structure through the air inlets.

Preferably, the Bladeless Fans draws air into the air inlets on the housing structure, through the rotatable Fan Wheels and coming out from the rotatable Fan Wheels into the centre of the housing structure, passing the ionizers and the UV lamp, wherein air particulates and odors are removed by the ionizers and air borne bacteria and viruses are killed by the UV lamps, before the treated air is passed through the air outlets and downwards into the surroundings of the enclosed room.

Preferably, the ionizers, UV lamps and bladeless fan in the device can be operated independently of one another.

More advantageously, the ionizers, UV lamps and bladeless fan can be operated together for improving the quality of air and improving air circulation in an enclosed space.

Preferably, a Central Control System for a device for improved air circulation in an enclosed space, has a first control board to control the operations of each ionizer, a second control board to control the operation of each UV lamp and a third control board to control the operation of each Fan wheel and motor.

Preferably the Central Control System in the device could operated remotely by infrared or wi-fi.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the invention, its advantages, and the objects attained by its use, reference should now be made to the accompanying drawings. The accompanying drawings illustrate one or more embodiments of the invention and

together with the description herein, serve to explain the workings and principles of the invention. The diagrams by no means restrict the invention to only what is shown.

As the invention relates to a device consisting of bladeless fans, UV lamps and ionisers,
5 which is installed on a ceiling of an enclosed area, the drawings of the apparatus is presented in an upside down manner, for the purpose of illustrating how the invention works.

Fig 1 shows an illustration of a housing of the invention.

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Fig 2 shows the details of the bladeless fan, with the ionisers and UV lamps of the invention.

Fig 3 shows a perspective view of the device with only the UV lamps shown and the
15 other functions covered up.

Fig 4 shows a perspective view of the device now with the UV lamps covered (as seen in normal working of the invention).

20 Fig 5 shows the view of the bladeless fan as seen installed on a ceiling. The UV lamps are covered by a protective shield.

Fig 6 shows the view of the bladeless fan with the ionisers highlighted.

25 Fig 7 shows the details and position of the ionisers.

Fig 8 shows the position of the rotatable Fan Wheels and motors which drive these rotatable Fan Wheels.

30 Fig 9 shows the position of the Rotatable Fan Wheels.

Fig 10 shows the positions of the air outlets.

Fig 11 shows the positions of the air outlets and air inlets

- 5 Fig 12 shows a perspective see-through view of the structure of the bladeless fan device with the UV lamps and ionisers.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

- 10 The present inventive Bladeless Fan takes air in the surrounding of an enclosed area such as a room in a house, cleans and sterilises the air as it passes into the Bladeless Fan and passes out clean and sterilised air. The Bladeless Fan by drawing the air from the surroundings into the device and then passing out clean and sterile air continuously would create a draft that moves air into it and then blow air out of the device, thereby
15 circulating the surrounding air in the enclosed space.

- The present invention be operated as a bladeless fan alone or as an ioniser or its UV lamps may be only switched on, depending on the objective of the user. For instance, the ionizers may be switched on to get rid of odours in the enclosed space.
20 Alternatively, the UV Lamps may be switched on kill viruses and bacteria in the enclosed space, if someone who is not well has been in the room The bladeless fan can also be used, either by itself, or with the ionisers switched on or the UV lamps switched on or when both eh ionisers and UV lamps are switched on.

- 25 The various components of the invention is described with reference to Fig 1 to Fig 12.

Fig 1 shows a perspective view of the housing of the device.

- As the invention relates to a device consisting of a bladeless fan, UV lamps and
30 ionisers, which is installed on a ceiling of an enclosed area, the drawings of the device

is presented in an upside down manner, for the purpose of illustrating how the invention works.

The invention is housed in a rectangular structure. This rectangular housing structure (10) enables the Bladeless Fans, ionizers and UV lamps to be contained in a compact and neat manner. The entire device is therefore efficient and aesthetically pleasant to the user.

The rectangular housing structure (10) is designed to be compact to contain motors and rotatable fan wheels being the bladeless fan and motor, a plurality of ionisers with a circuit board and a plurality of UV lamps. The housing has to be rectangular in shape so that all the functions – UV lamps, ionizers and Bladeless Fans in the form of Rotatable Fan Wheels with motors and Cenral control System could be efficiently and compactly arranged in this structure. The rectangular housing has a series of perforations which are air inlets (12) and air outlets (14), for surrounding air to be drawn in and treated air to be circulated back into the surroundings. The rectangular housing structure has a base (16) by which the entire device may be installed onto a ceiling.

UV Lamps – Sterilising Feature

The main parts of the UV lamps forming the UV Light Generating function are now described with reference to Fig 2 to Fig 4.

Fig 2 shows the device with the UV Lamps (20) with the ionisers and air blowers and related parts. There are three UV lamps (20) placed in the centre of the base (16) of the housing.

Fig 3 shows the UV Lamps shown with its protective cover (not shown) removed.

Fig 4 shows the protective cover of the UV Lamps (24), The UV lamps are therefore not shown.

Ultraviolet Sterilization can be achieved by using the ultraviolet light with a wavelength of 254 nanometers to destroy the molecular structure of DNA (deoxyribonucleic acid) or RNA (ribonucleic acid) in microbial cells, causing the death of growth cell and regenerative cell. The air circulation is continuously increased through the bladeless fan on each side, so that the air in an enclosed space such as a room is continuously sterilized.

Fig 5 shows a view of the invention with the protective cover (24).

10 **Ionizers – removing air particulates and odors**

The main parts of the ionizers are now described with reference to Fig 6 to Fig 7.

Fig 6 shows a view of the invention showing the ionisers (30) and Bladeless Fans (40) which consists of Rotatable Fan Wheels (42) and motors (44).

Fig 7 shows the position of the three ionisers (30). Each ionizer (30) is positioned in three corners of the housing structure (10) and the last corner is taken up by a control board (not shown) which controls and regulates the functions of the ionisers.

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In order to generate negative ions, the negative ion generator raises the low voltage to DC negative high voltage through the booster circuit, use the carbon brush tip DC high voltage to generate high corona, release a large number of electrons (e-) at high speed, and electrons cannot exist in the air for a long time. It will be captured by oxygen molecules (O₂) in the air immediately to form negative ions. Its working principle is consistent with the phenomenon of negative ions produced during the natural phenomenon of “thunder and lightning”. The generated negative ions are continuously circulated with the surrounding air, so as to purify the air more effectively, thereby improving the quality of air indoors.

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In order to effectively treat air within the enclosed surroundings such as a room, the air must be circulated and drawn into the device so that the air could be treated with ionisers and UV lamps.

5 Bladeless Fans – For improved Air Circulation and Air Quality

The main parts of the air circulation system are now described with reference to Fig 8 to Fig 11.

- 10 Fig 8 shows a view of the invention with the position of the Bladeless Fans (40) which consists of a plurality of motors (44) and Rotable Fan Wheels (42). Each Rotatable Fan Wheel (42) is located on each side of the housing structure and a fan motor (44) positioned next to the Rotatable Fan Wheel (42) on one side.
- 15 Fig 9 shows a view of the Bladeless Fan (40) which consists of a Rotable Fan Wheels (42) and a motor (44). The Rotatable Fan Wheels (42) rotate around an axis along the length of the Fan Wheel, being driven by a motor (44), positioned at one end of the fan wheel. Air is drawn into through the air inlets (12) of the device by the rotation of the Fan Wheel (42) and the air is then passed through the UV lamps and ionizers, before
- 20 being expelled through the air outlets (14) on the side of the housing structure. In this manner, the air is treated with UV light to kill air borne viruses and bacteria and further treated by the ionisers to remove odors and air borne particulates.

- Fig 10 shows a view of the invention with the air outlets (14) for air to be released into
- 25 the surroundings after going into the housing structure. The treated air, is blown out into the surroundings through the air outlets (14) of the device. Since the device is installed in a high position particularly a ceiling, the treated air when blown out through the air inlets, would naturally descend downwards. The improved quality of the treated air could be experienced immediately by any user in the enclosure.

Fig 11 shows a view of the invention with the air outlets (14) and air inlets (12) for air to be drawn into the bladeless fan system (40) and for the air to be released downwards into the surroundings after being treated by the ionisers and UV Light.

- 5 Fig 12 shows a perspective see-through view of the structure of the bladeless fan device, with the Rotatable Fans (40), UV lamps (20) and ionisers (30).

There are four rows of air inlets on the inner side and four rows of air inlets on the back. Air outlets are located on the bottom end of the rectangular housing structure (facing the
10 user if the user looks up). Therefore when the four Rotatable Fan Wheels which swing or rotate, the air (after passing through the UV lamps and ionizers) are now directed towards the air outlets, thus blowing the cleaned and treated air downwards into the lower part of the enclosed room. .

- 15 The movement of the Rotatable Fan Wheels are controlled by a small internal motor which rotate the Fan Wheel, thus continuously expelling air downwards, the expelled air which have been cleaned and sterilized after going through the ionizers and UV lamps.

Central Control System – to control all functions singly and synergistically

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The motor of each Rotatable Fan Wheel draws air from the surroundings through the air inlets. The air drawn into the Rotatable Fan Wheel is then pushed out through the air outlets. As the air passes through the air outlets, the air is then ionized and also treated by the UV lamps. Odours and small air particles from the air would be removed by the
25 ionisers. Bacteria and viruses in the air drawn in are killed by the UV light as these bacteria and viruses pass through the UV Lamps in the device. To ensure proper coordination and timing for smooth and coordinated operations, a central control system is necessary. The control system controls the operation of a control board for each type of function in the device – a control board for the ionizers, a control board for the UV
30 Lamps and a control board for the bladeless fans. Such control systems are known and would not be described herein.

The central control system also allows the operation of one or two or all three systems together. It would be possible to only switch on the UV lamps for a certain duration of time, to remove air borne bacteria and viruses. It is also possible to operate the ionizers independently to remove odors and air particulates. If both the ionizers and the UV lamps have been operated for some time and the enclosed air is considered clean, the ionizers and UV lamps may be switched off and the bladeless fans switched on just for improved air circulation. It may be seen that the inventive device would synergistically improved air circulation and at the same time improve air quality.

10 Other embodiments

While a preferred embodiment of the Bladeless Fan with ionizers and UV light for air circulation with improved air quality has been described, it should be apparent, however, that various modifications, rearrangements, substitutions, alterations and adaptations to those embodiments may occur to persons skilled in the art with the attainment of some or all of the advantages of the present invention. Accordingly, it should be clearly understood that the present invention is not intended to be limited by the particular features and structures hereinbefore described and depicted in the accompanying drawings. It is therefore intended to cover all such modifications, alterations and adaptations without departing from the scope and spirit of the present invention as defined by the appended claims.

ADVANTAGEOUS EFFECTS OF THE INVENTION

The present invention allows the use of three separate functions for improved air quality to be used in a single device – for improvement in air circulation and improvement in air quality through removal of odours and air borne particles as well as destruction of air borne viruses and bacteria.

The device is designed and built to be installed on the ceiling of any confined space inside a building, be it a room in an office or a room in an apartment. The three

functions for improvement in air quality could be used independently of each other e.g. the ionizers could be turn on when there is a requirement to remove strong odours. The UV lights could be turned on to kill air borne viruses and bacteria if someone has been coughing in the room earlier on. In a normal situation, the bladeless fan can be switched
 5 on, for improved air circulation. Therefore, the device is flexible and space saving, since use of this device eliminates the use of an ioniser which has to be placed in the room and an UV light source which has to be positioned near the ceiling, to prevent direct sight of the UV light.

10 The placement of this device on the ceiling is not only aesthetically pleasing to the eye but space saving too, since all three functions are incorporated into a compact device installed on the ceiling.

Thus this present invention gives it a massive advantage over having and operating
 15 three different devices separately, an ionizer for improvement in air quality through removal of odours and particles, an UV lamp for improvement of air quality through removal of bacteria and viruses and improvement of air quality by improved circulation of air within the enclosed room.

20 An unique three in one inventive product
 A bladeless fan for improved air circulation
 Ionizers to remove odors and air borne particles
 UV lamps to kill viruses and bacteria by sterilization

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CLAIMS

1. A device for improved air circulation and quality in an enclosed space, having a rectangular housing structure, four corners and sides, a base for fixing the rectangular housing structure to a ceiling, with air inlets for air in the surroundings to be drawn into the housing structure and air outlets for air to draw from the rectangular housing structure, and circulated back into the enclosed space, the device comprising :-

a. a plurality of ionizers to remove odors and air particulates,

b. a plurality of UV lamps;

c. a plurality of Bladeless Fans; and

d. a Central Controls System which controls the ionizers, UV lamps and Bladeless Fans,

all of which are compactly laid out in the rectangular housing structure to treat and improve the quality of air in the surroundings.

2. The device for improved air circulation and air quality in an enclosed space, as claimed in Claim 1, wherein air is drawn into the air inlets of the rectangular housing structure by the Bladeless Fans, treated by passing through the plurality of ionizers, thereby removing odors and air particulates, further treated by the UV Lamps to kill airborne bacteria and viruses, and then the air being treated is expelled through the air outlets in the rectangular housing structure, thereby improving air circulation in the enclosed space and improving air quality with odors and air particulates having been removed and air borne bacteria and viruses having been killed.

3. The device as claimed in Claim 1 wherein the ionizers are installed in three corners of the rectangular housing structure and a control board installed in the fourth corner of the rectangular housing structure.

5 4. The device as claimed in Claim 1 wherein the UV lamps are installed on the base of the rectangular housing structure.

5. The device as claimed in Claim 4 wherein the UV lamps have a protective cover installed below the UV lamps, with an air gap between the UV lamps and the protective
10 cover.

6. The UV lamps as claimed in Claim 5 wherein the UV lamps operates with a wavelength of 254 nanometers.

15 7. The device as claimed in Claim 1 wherein the ionisers are installed in the 1st to 3rd corners of the housing structure and operated and controlled by a control board installed at the 4th corner of the housing structure.

8. The device as claimed in Claim 1 wherein a Bladeless Fan is installed on each side
20 of the rectangular housing structure, said Bladeless Fan consisting of a Rotatable Fan Wheel and a motor to turn the Rotatable Fan Wheel, drawing air from the surrounding into the rectangular housing structure through the air inlets.

9. The device as claimed in Claim 1 wherein the Bladeless Fan has a Rotatable Fan
25 Wheel and a motor to turn the rotatable Fan Wheel, expelling air which have been drawn from the surrounding and treated by the ionizers and the UV lamps, the expelled air going through the air outlets, and downwards into the surroundings.

10. The device as claimed in Claim 9, wherein the air is drawn into the air inlets on the
30 housing structure, through the Rotatable Fan Wheels and coming out from the Rotatable Fan Wheel into the housing structure, passing through the ionizers and the

UV lamps, wherein air particulates and odors are removed by the ionizers and air borne bacteria and viruses are killed by the UV lamps, before the air being treated is passed through the air outlets and downwards into the surroundings of the enclosed room.

5 11. The device as claimed in Claim 1, wherein the ionizers, the UV lamps and the Rotatable Bladeless Fan are operated independently of one another.

12. The device for improved air circulation and air quality in an enclosed space, as claimed in Claim 1, wherein the ionizers, the UV lamps and the Bladeless Fans can be
10 operated together for improving the quality of air and improving air circulation in the enclosed space.

13. The device as claimed in Claim 1, further comprising a Central Control System to control a first control board for operations of the ionizers, a second control board for
15 operations of the UV lamps and a third control board to control the operation of each Rotatable Fan wheel and motor.

14. The device as claimed in Claim 1 wherein the Central Control System in the device could be operated remotely by infrared or wi-fi.